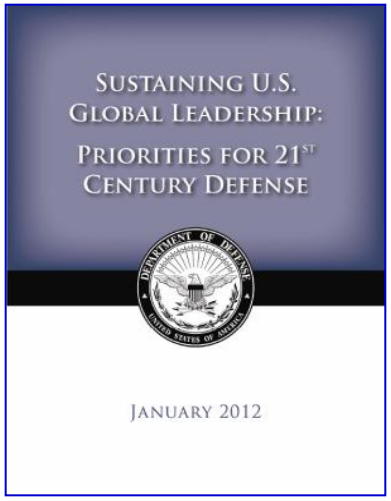
# Current S&T priorities and the Future of DOD S&T

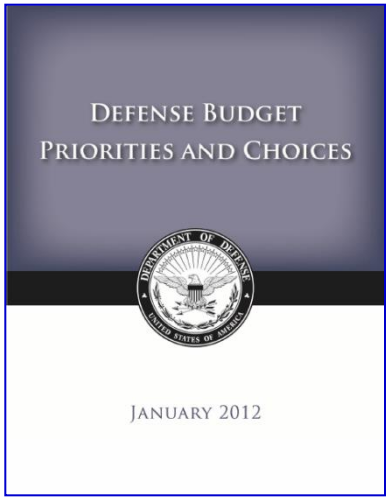
**29 October 2013**


## Al Shaffer

**Acting Assistant Secretary of Defense for Research and Engineering**

# Key Elements of Defense Strategic Guidance

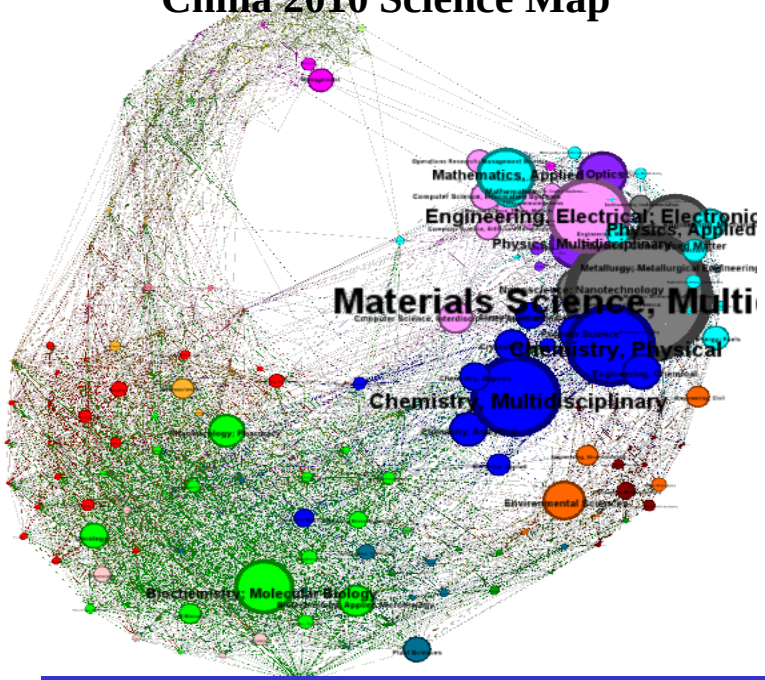




- The military will be smaller and leaner, but it will be agile, flexible, ready and technologically advanced.
- Rebalance our global posture and presence to emphasize Asia-Pacific regions.
- Build innovative partnerships and strengthen key alliances and partnerships elsewhere in the world.
- Ensure that we can quickly confront and defeat aggression from any adversary – anytime, anywhere.
- Protect and prioritize key investments in technology and new capabilities, as well as our capacity to grow, adapt and mobilize as needed.

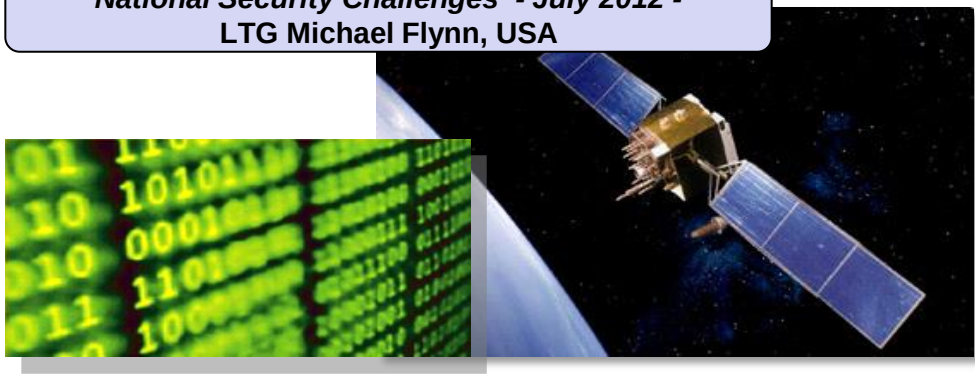
# Complexities of Our National Security Environment

- Global environment is ever changing and uncertain
- Future is hard to predict

**China 2010 Science Map**




***National Security Challenges - July 2012 -***
**LTG Michael Flynn, USA**



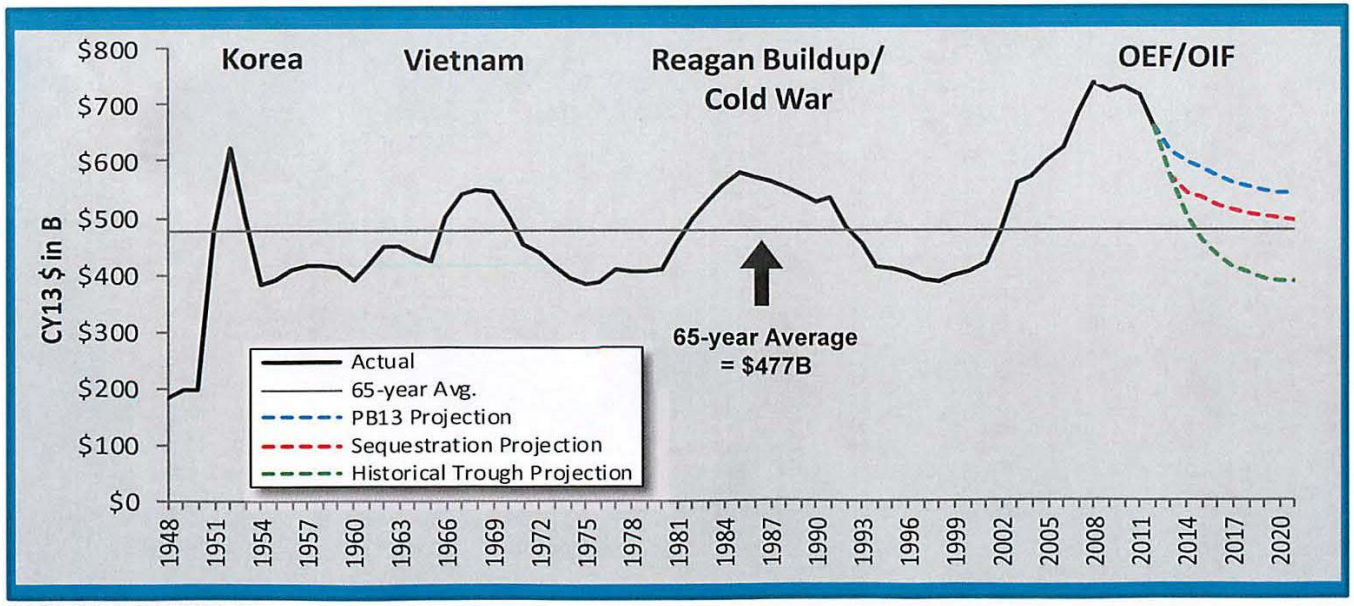
- Spread of free markets and open societies has accelerated globalization
- Our next conflict could be an unconventional conflict against a highly asymmetrical threat

**Ability to Operate in the Commons will be Critical**

# The Reality….

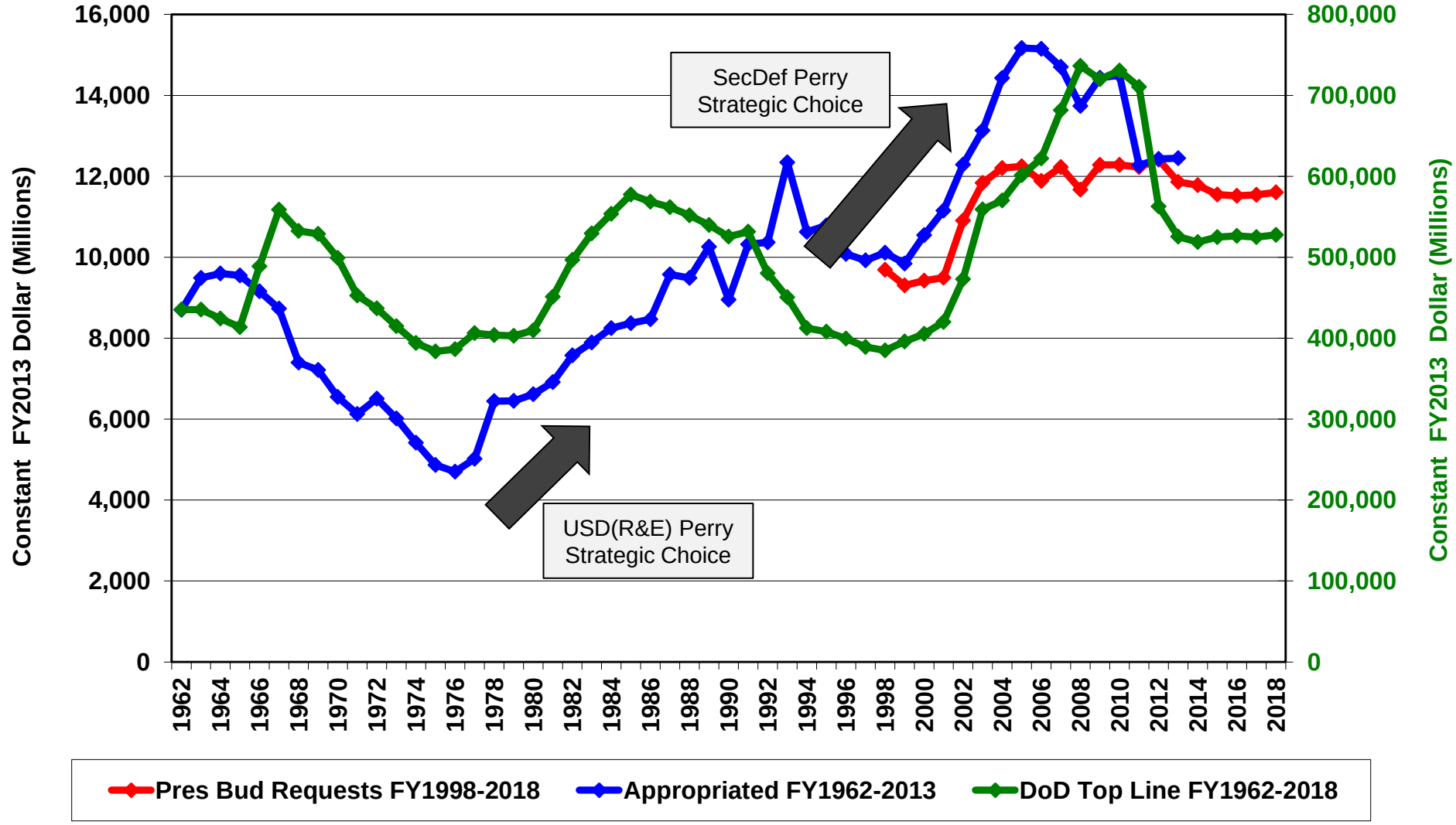
*"Our current security challenges are more formidable and complex than those we faced in downturns following Korea, Vietnam, and the Cold War. There is no foreseeable "peace dividend" on our horizon."*

GEN DEMPSEY, CJCS
Testimony to SASC, 12 Feb 2013




UNCLASSIFIED

# During Previous Budget Pressures, DoD Protects the Future through R&E



# Defense R&E Strategy

*"Protect and prioritize key investments in technology and new capabilities, as well as our capacity to grow, adapt and mobilize as needed."*

-SECDEF, January 2012 Strategic Guidance

**1. Mitigate new and emerging capabilities**

- Electronic Warfare
- Cyber
- Counter Space
- Counter-WMD

**2. Affordably enable new or extended capabilities in existing military systems**

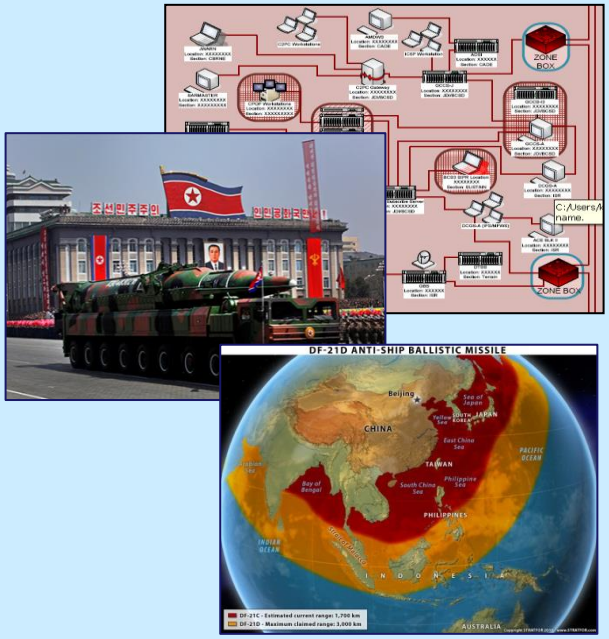
- Systems Engineering
- Data Reuse
- Engineered Resilient Systems
- Developmental Test & Evaluation

**3. Develop technology surprise through science and engineering**

- Autonomy
- Basic Research
- Data-to-Decisions
- Human Systems

**ASD(R&E) Should Lead the Future**

## Technology Needs

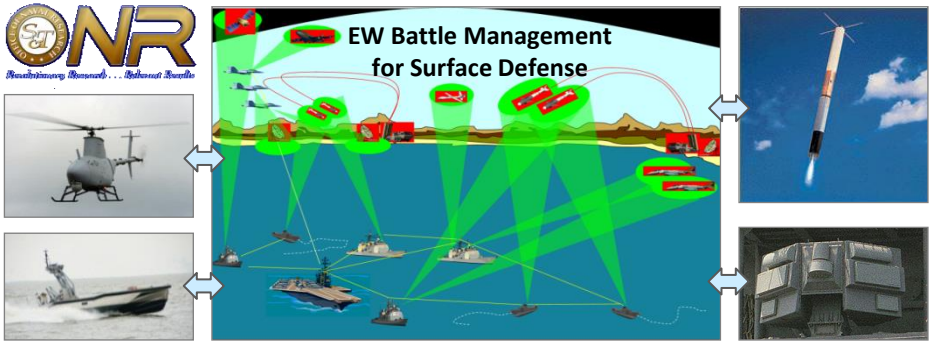



- Middle East Instability
- North Korean Nuclear Ambitions
- Anti-Access/Area Denial
- Cyber Attacks
- Electronic Warfare

# Mitigate:
# EW, Cyber, Counter-Space, Counter-WMD

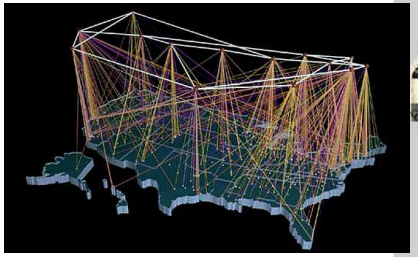
## Electronic Warfare & Protection

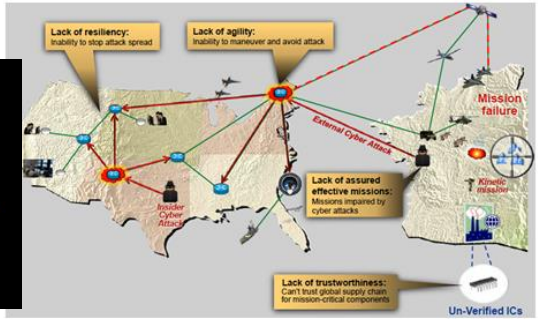
- RF/Mixed Signal Component Technologies
- EO/IR Component Technologies
- Underlying technology enablers




## Cyber Science and Technology

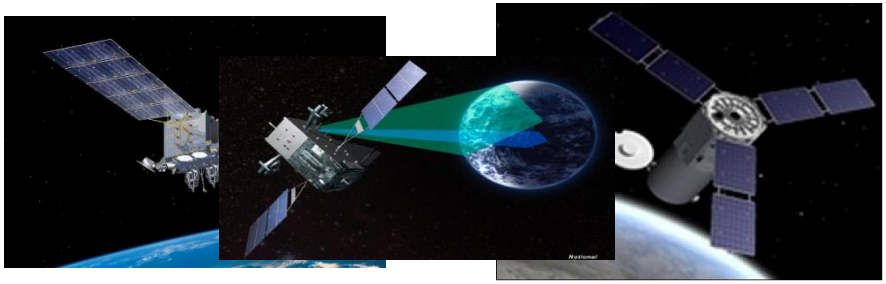
- Assuring Effective Missions
- Resilient Infrastructure Trust
- Cyber Experimentation & Measurement
- Agile Operations






## Counter-Space

- Contested domains with critical importance
- Gaining and maintaining space superiority
- Future enemies deny US operational access



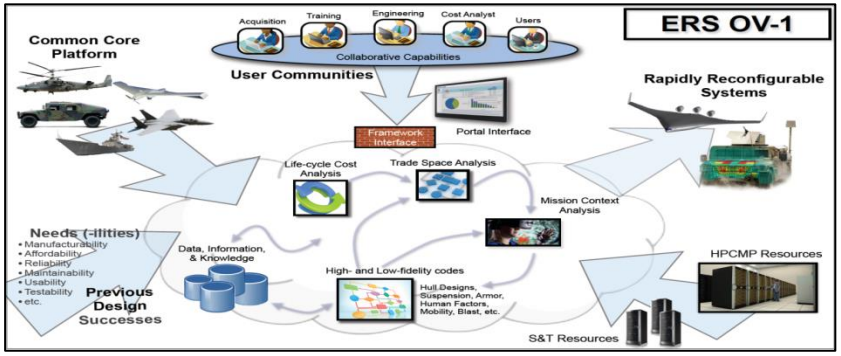
## Counter-WMD

- Sensors
- Network Analytics
- Data Integration
- Predictive Tools

# Affordability:
## Engineered Resilient Systems (ERS), Data Reuse, Enhanced Prototyping

## Engineered Resilient Systems (ERS)

- Decrease time and cost of system development
- Improve effectiveness of fielded systems




## Data Reuse

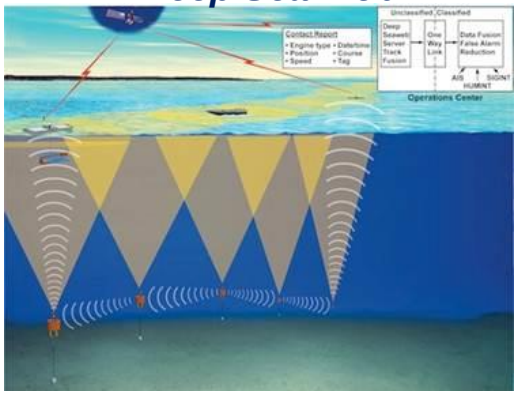
- Defense Innovation Marketplace
- Devoted to making it easier for you to find out about DoD's S&T and Program Investments
- IR&D Projects


## Enhanced Prototyping

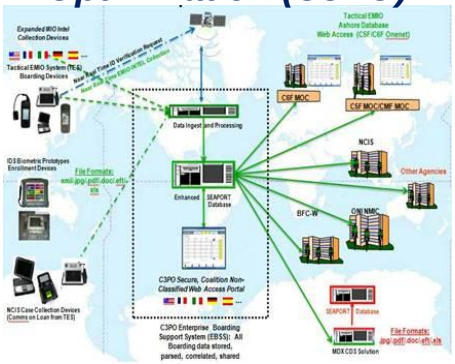
### *Kestrel Eye*

### *SNaP 3*

### *Deep Sea Web*




### *Coalition End-to-End EMIO Performance Optimization (C3PO)*



# Tech Surprise:
## Human Systems, Data-to-Decisions, Autonomy

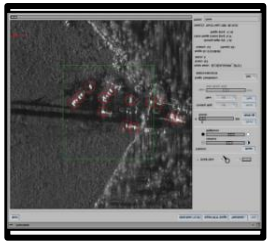
### Human Systems

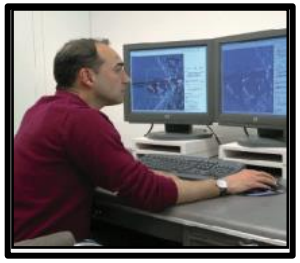
- System Interfaces
- Personnel & Training
- Protection & Sustainment
- Social & Cultural Understanding

### Data-to-Decisions

- Data Management
- Analytics
- User Interface

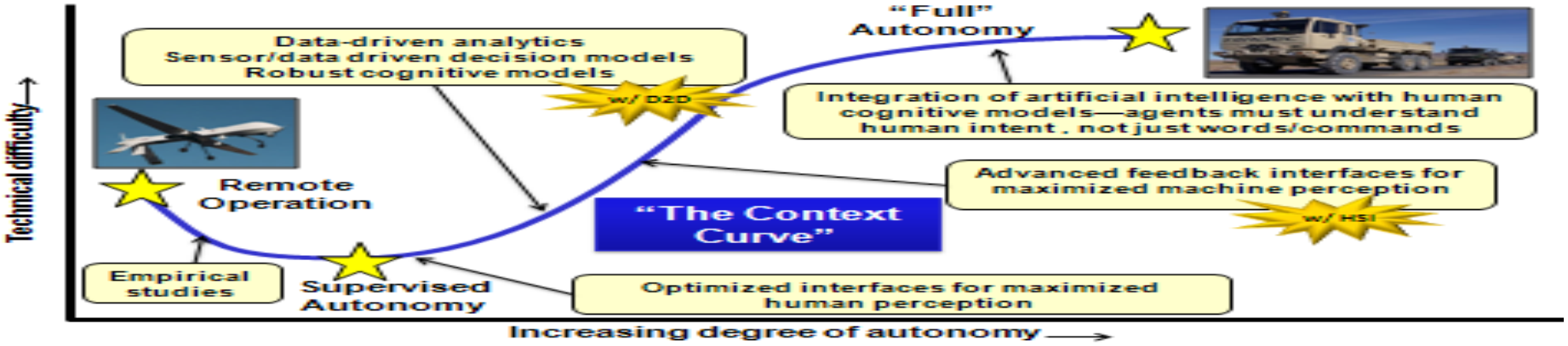
Multi-Layer Approach



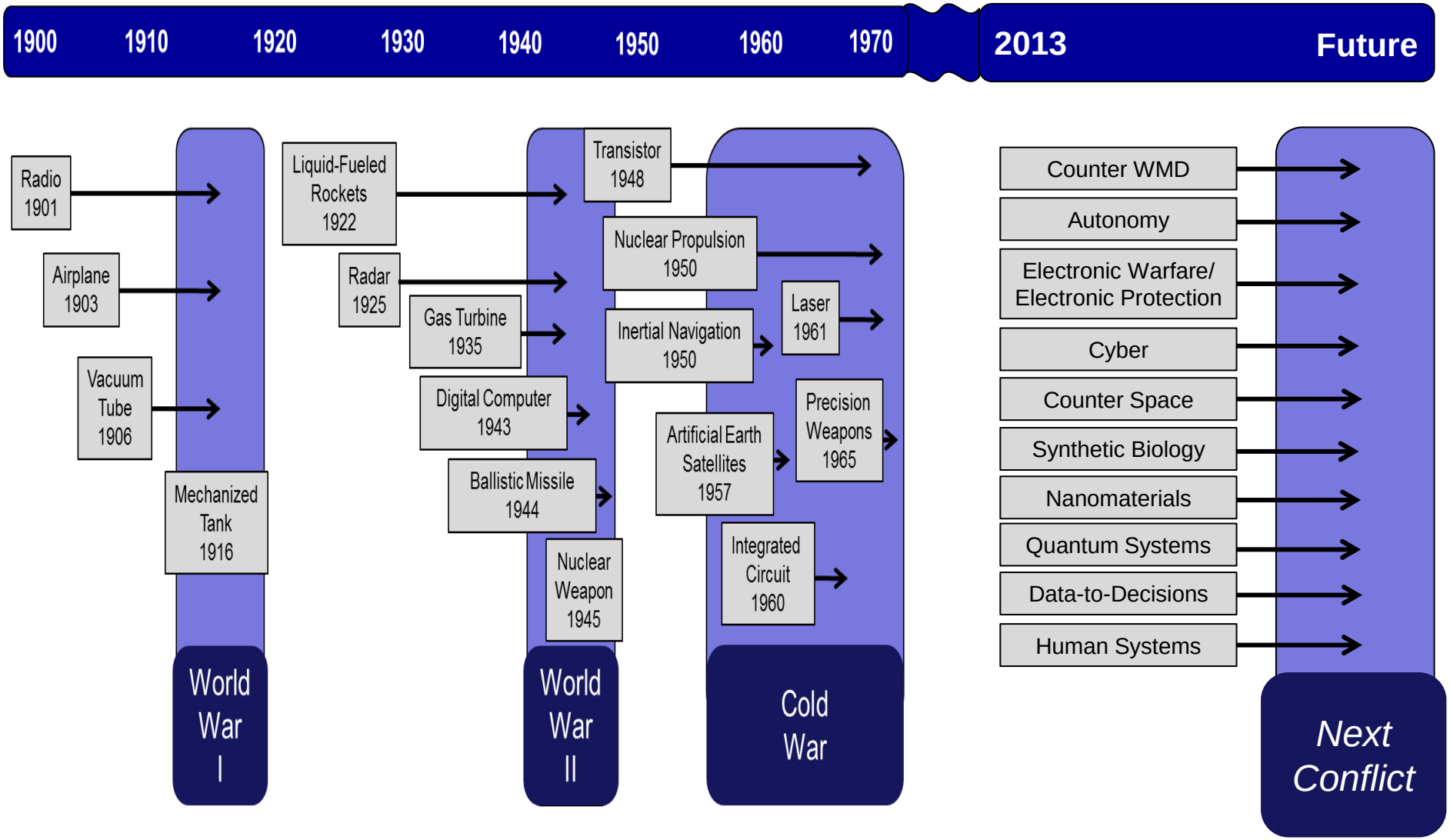


### Autonomy

Environment – Capability - Technology

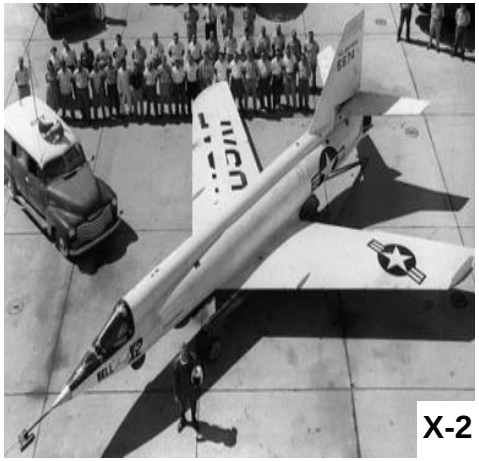


# Lab Demo to Forcing Function: Technology Investment Stocks Cupboard

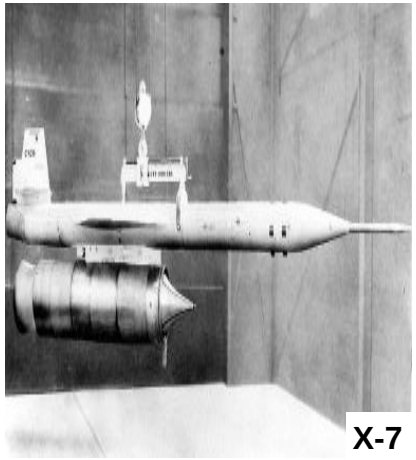


# Capability Prototyping
## High Speed X-Planes


**First flight: 1947**
**Speed: Mach 1.26**




**First flight: 1952**
**Speed: Mach 3.2**




**First Flight: 1951**
**Speed: Mach 4.31**


**First Flight: 1953**
**Speed: Mach 2**

# Capability Prototyping
## High Speed X-Planes


**First Flight: 1959**
**Speed: Mach 6.7**


**First Flight: 2001**
**Speed: Mach 6.83**


**First Flight: 2010**
**Speed: Mach 5.1**

# Concepts for Change

- **Design is a Commodity**
- **Computer-Based Designs/Trades**
- **Prototypes**
- **Technology-Intelligence Interaction**
- **Challenge In-house Labs**
- **Industry Outreach**

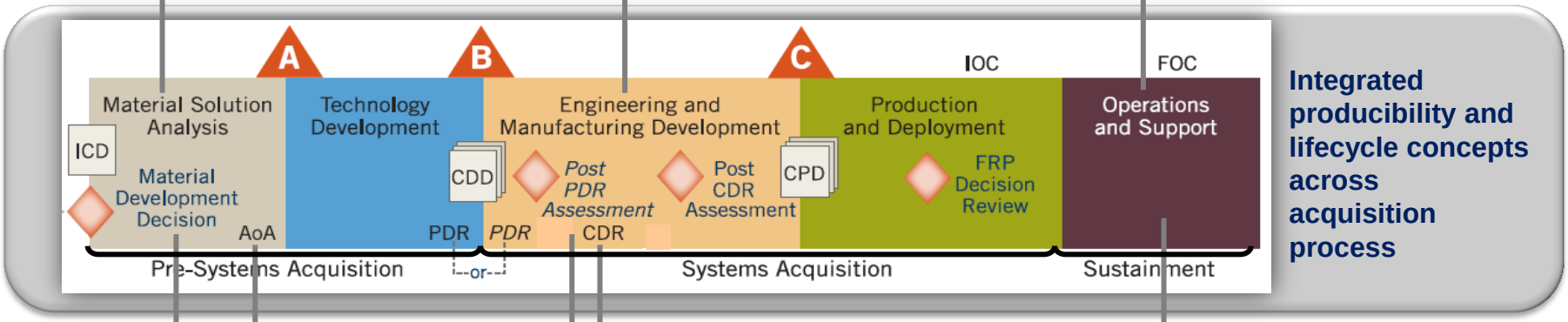
# Design as a Commodity
## Engineered Resilient Systems (ERS) Goals

## ERS aligns with Better Buying Power 2.0

More complete and robust requirements

Engineering design process more efficient & effective

75% reduction in time to complete systems by reducing rework




Integrated producibility and lifecycle concepts across acquisition process

Establish baseline resiliency of current capabilities

100-fold increase in # of parameters and scenarios considered in setting requirements

Explicitly consider manufacturability and affordability of proposed design(s)

Quantified adaptability to changing mission requirements

= Decision Point

= Milestone Review

**ERS Goals to be accomplished via combination of high fidelity modeling, simulation, tradespace analysis, and the inclusion of mission context assessment**

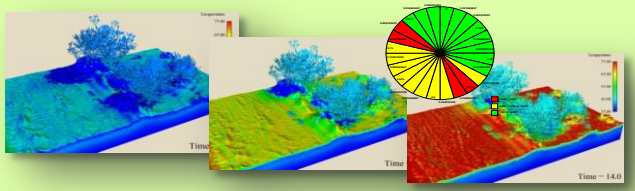
# Computer Based Design - Trades

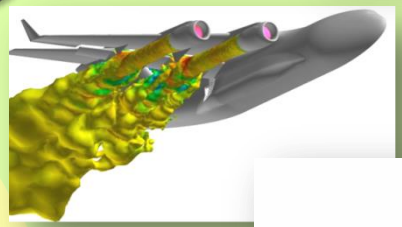
**Example:** High-fidelity natural environment, sub-system, and mission models to predict and improve performance of Current and Future Force land, naval, and air systems for identifying technical solutions to mission requirements

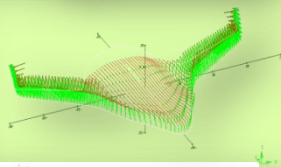
## Design/Model

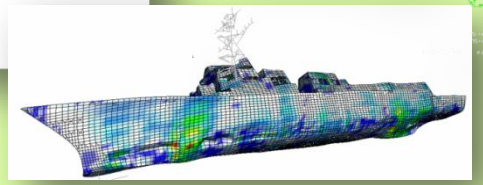
ERS

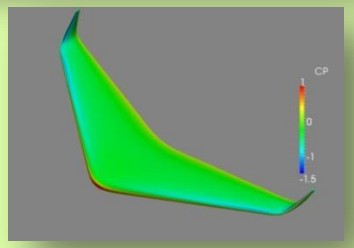
## Analyze



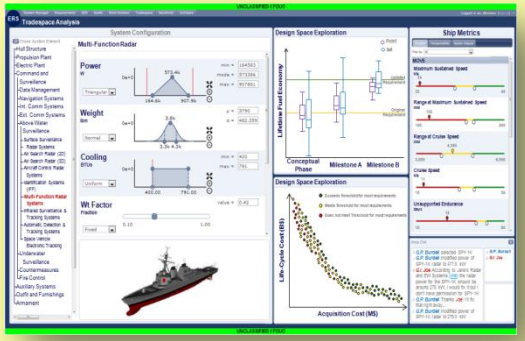








## Trade/Decide



# Prototypes

**The Department can cost-effectively drive innovation in aviation, space, maritime and ground combat systems through prototyping**

**Proof of Concept:**

**“X”- Plane Prototyping**

**Prototype Development Programs have expanded the state of the possible in military aviation without each necessarily driving a follow-on procurement activity**





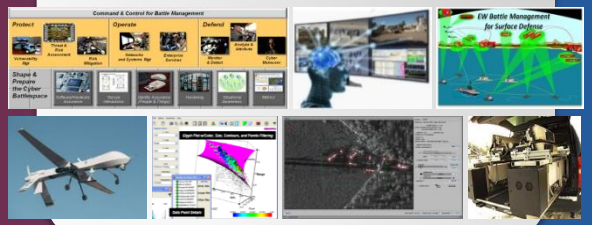
# Technology Intelligence Interaction

## Near Term

Specific potential adversary system performance

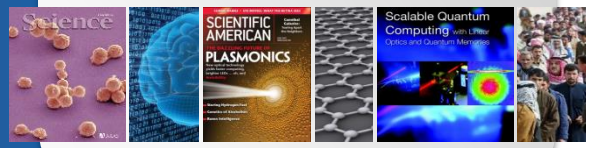
## Mid Term

Strategic force development plans



## Far Term

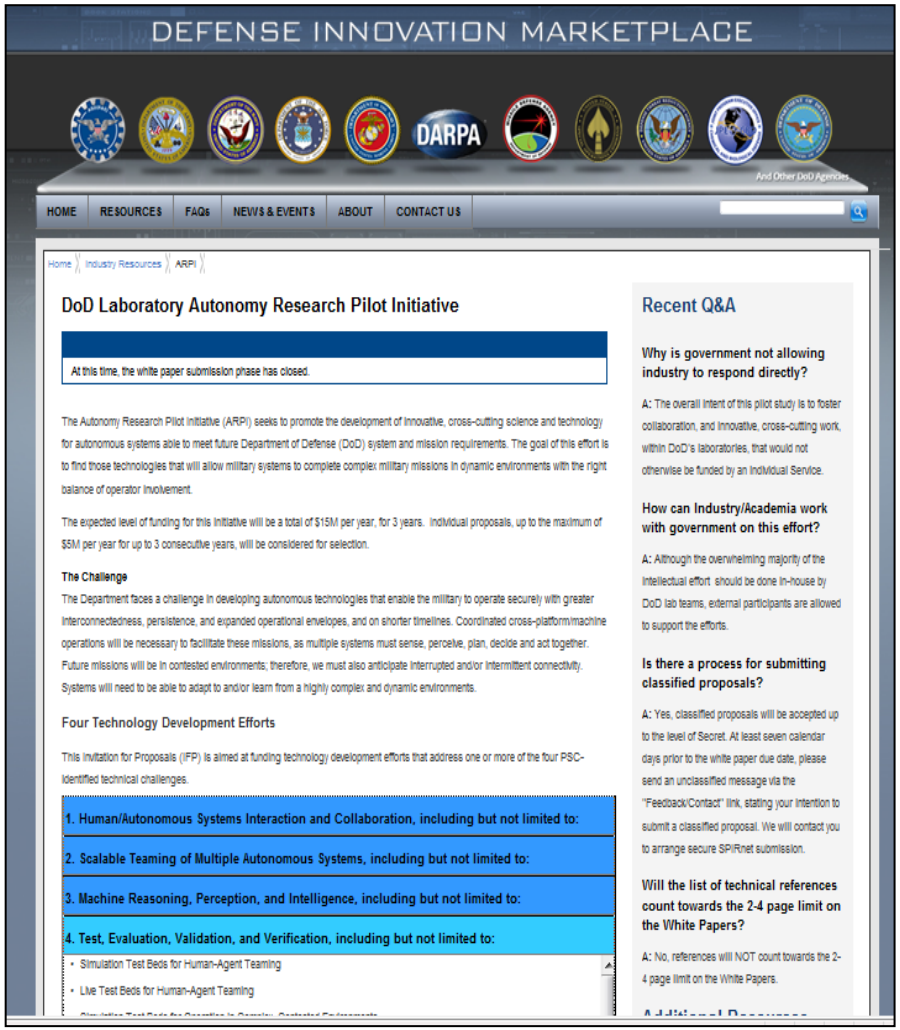
Understanding investment in research coupled with assessment of potential adversary capabilities




**Prepare for an Uncertain Future**

# Challenge to the Labs
## Autonomy Research Pilot Initiative (ARPI)

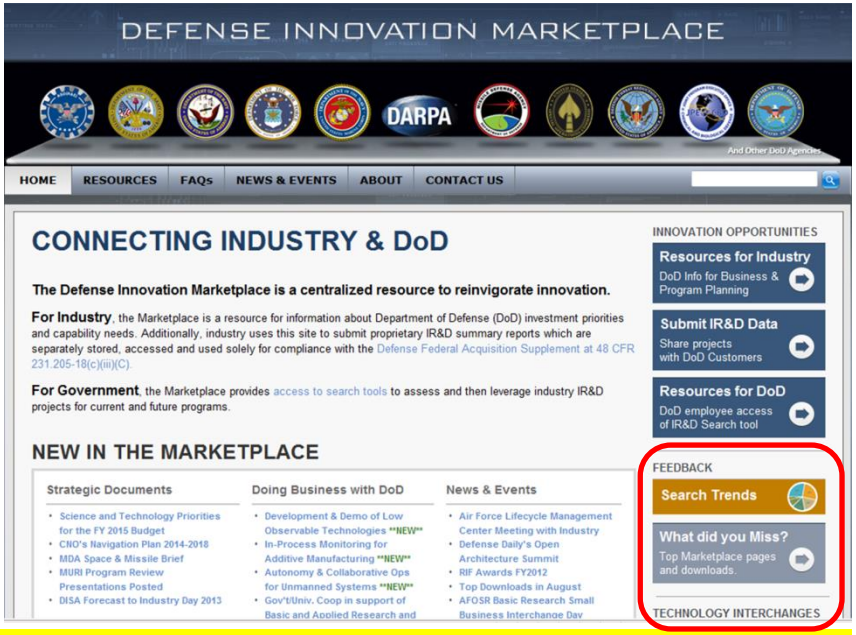
- **Allow military systems to complete complex military missions in dynamic environments**
- **Source Selection Just Completed**
- **Funding: $15M per year - 3 years**
- **Focused on addressing PSC-identified technical challenges**
  - **Human/Autonomous Systems Interaction**
  - **Scalable Teaming of Multiple Autonomous Systems**
  - **Machine Reasoning, Perception, and Intelligence**
  - **Test, Evaluation, Validation, and Verification**



# Defense Innovation Marketplace

Resources For Industry And DoD

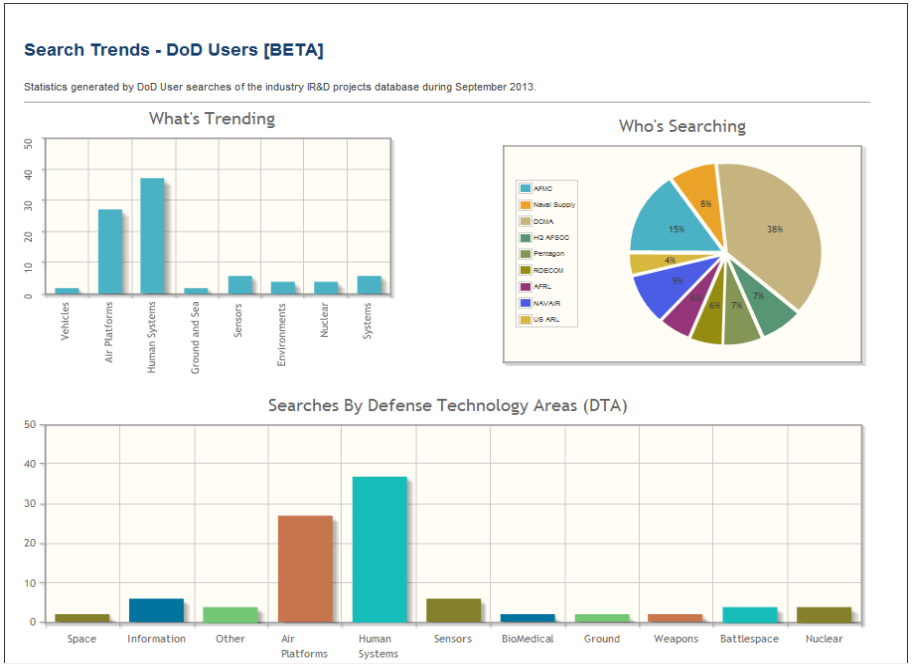
## Improve Industry understanding of DoD needs




**www.DefenseInnovationMarketplace.mil**

### Marketplace: Resources for Industry

- DoD R&D Roadmaps; Investment Strategy
- Business Opportunities with the DoD
- Virtual Interchanges & Events
- Secure Portal for IR&D Project Summaries
- Top Downloads/Pages visited
- DoD IR&D SEARCH Trends




### Marketplace: Resources for DoD

- Secure portal with 8,000+ IR&D Project Summaries
- Access for DoD R&D and Acquisition Professionals
- DoD Searchers encouraged to contact the Industry POC listed on project summaries of interest

**“We are out of money.
Now we must think!”**

Winston Churchill to
Parliament during World War II
*(Stolen from Ernest Rutherford)*

# Summary

- DoD is working on advanced programs to enhance the ability to control the enablers

- 50 years ago during a military conflict, the strongest won based on the “biggest arms”. Today’s and future conflict will be determined by the ability to process information faster and reduce cognitive response time